ON THE TAXONOMY, BIOLOGY, AND DISTRIBUTION OF THE BITING LICE OF THE FAMILY GYROPIDAE.

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INTRODUCTION.

The family Gyropidae is a small family of biting lice that for many years included but the single genus *Gyropus* Nitzsch and its two species, the two common biting lice of the guinea pig. Later other species were added to this genus, and in 1910, Mjöberg, in his extended studies on the Mallophaga and Anoplura, divided it, erecting the new genus *Gliricola* for the slender species of the guinea pig. Mjöberg was the first to give any good account of the mouth-parts and certain important external characters of these lice, yet he made no attempt to allocate the described species to the two genera, which he recognized.

In 1912 Neumann gave the first and, up to the present, the only comprehensive account of the contained species. He recognized the group as a whole as constituting only the single genus *Gyropus* Nitzsch, Mjörberg's paper apparently being overlooked. Neumann was the first to possess an abundance of material, and for this reason his work is very valuable. He added five new species and one new subspecies to the group and gave, among other things, a key to most of the described species.

Recently the present writer has had the opportunity of examining a large collection of rodent and other mammal skins brought fresh from South America by Dr. Alexander Wetmore, of the Bureau of Biological Survey. These skins were taken during 1920 and 1921 in Argentina, Paraguay, and Uruguay. There were about 150 of them, and each had its accession number. Those that are mentioned in the present paper have been determined to genera for the writer by A. H. Howell, of the Bureau of Biological Survey. From the collections made from these fresh skins others were added from old museum skins in the United States National Museum, which had been previously determined to species. With this abundance of material, to which should be added the specimens of the division of

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insects of the United States National Museum, the writer seemed justified in undertaking the preparation of a review of the whole family. The paper here presented, while falling far short of a monographic attempt, does give, it is believed, a fairly adequate survey of the family as a whole.

To the 14 valid species recognized by Harrison (1916) in his catalogue of the Mallophaga as belonging to the family Gyropidae, there are here added 12 more; while the number of genera in the family is here increased from 2 to 9. Certainly only a small percentage of the species of the family is represented by these 26 species.

In the preparation of this paper assistance has been rendered by various persons. The writer wishes to acknowledge his indebtedness, first to Dr. Alexander Wetmore, of the Bureau of Biological Survey, who made the collection of the fresh mammal skins examined, also to Dr. H. H. T. Jackson, of the Bureau of Biological Survey. Gerrit S. Miller, jr., curator of the division of mammals, of the United States National Museum, very kindly granted the writer permission to examine many mammal skins in the division collections, and H. H. Shamel rendered much assistance in many ways during the collection of specimens from the dried museum skins. Lastly the writer is indebted to Mrs. Nettie Klopfer, of the Bureau of Entomology, United States Department of Agriculture, for aid in mounting specimens on microscope slides.

FAMILY CHARACTERS.

Probably no family of the order Mallophaga is so clearly marked off from the others as the family Gyropidae; however, the present writer has found at least three unusual species which help bridge over, to a certain degree, the gap between the one-clawed, mammal-infesting *Amblycera* and the other two-clawed species which infest both mammals and birds.

Formerly the family was differentiated from all others in its suborder in having but a single claw to each tarsus and some of the legs circular (hence the name *Gyropus*). This assumption of a circular shape by the legs is the result, as I have found by observing living specimens, of their adaptation for hair clasping. The writer now finds that there are two new species to be added which have two claws to each front tarsus and one new species with none of the legs circular and adapted for hair clasping. These finds will necessitate somewhat a revision of the family characters.

As now constituted the family Gyropidae may be characterized as including all those Amblyceran Mallophaga which have but a single claw on each leg of the two posterior pairs, and, with but a single exception, some of the legs modified into hair claspers; the palpi

either two, three, or four segmented; the antennae four-segmented, but frequently appearing three-segmented; the head with broad deep antennal fossae and the temporal region rounded.

HABITS.

Observations on habits were confined to the two species, *Gyropus ovalis* Nitzsch and *Gliricola porcelli* (Linnaeus), occurring on the guinea pig. A young, white guinea pig, infested with both these species was obtained and by constant handling and training was brought to such a state of confidence and contentment that it would rest on the stage of a binocular microscope for long periods while observations were being made on the louse species it harbored. The white hair greatly aided both in locating and in following the lice through the fur. During this process the fur would be parted repeatedly by the use of a comb or forceps. Lice also were removed both with and without some of the hairs of the host for observation with the higher powers of the compound microscope.

Food.—No definite conclusion could be drawn from the observations made on food habits. That the food of both these species consists in part of cutaneous secretions and excretions and in the case of *G. porcelli* of serum in addition, is indicated by several observations. First, it was noticed that both louse species remained practically all the time next to the skin. Notwithstanding the guinea pig was heavily infested with lice, the latter were seldom noticed except when the fur was parted. Again, a combing with a fine-toothed comb, such as is used to remove the head lice of man, only brought to the surface two individuals. When observed resting both species of lice held their heads against the skin of the host. Further, the eggs were invariably laid at the bases of the hairs, and almost always only a single one to a hair.

Mjöberg was the first one to demonstrate in *G. porcelli* a type of lancing mouth parts. The lancing or sticking apparatus was no other than the outer hypopharyngeal chitinization. In a related species this chitinization (fig. 14) is provided with two anterior, divergent horns which are not armed, but in *G. porcelli* they are armed (fig. 15) with minute serrations on their inner margins and teeth at their tips. Mjöberg observed that these horns were drawn back and forth and outward by the action of muscles attached to the posterior tendon. I have confirmed his observation by noting the action of the mouth parts in live specimens.

It is very probable that *G. porcelli* used this cutting or piercing hypopharyngeal apparatus by thrusting it into the mouth of a hair follicle then drawing the horns sidewise and cutting or abrading the skin. I have never observed this species resting with its body

against the skin. It always clasps a hair, and when coming to the skin thrusts its head to the opening of a hair follicle, holding the hair, clasped all the time with the second and third pairs of legs. The products of the oil glands, which open through the mouths of the hair follicles probably also constitute an important item in the diet of this species. A heavy infestation with this louse apparently causes the hairs to become brittle.

No evidence was found indicating that the hairs of the host were eaten or used in any way for food. Specimens mounted on slides, as well as live ones, showed the stomach to be free from any solid bits of hairs. Also, hairs removed from areas of greatest infestation and examined microscopically each showed a normal, tapering tip and no marks of mandibles or mechanical injury in any way. Bird-infesting Mallophaga feed to a considerable extent on the horny, cutaneous growths of the host; in fact, one injurious species is known as the "depluming louse" because it literally eats up most of the feathers on certain heavily infested areas of the host's skin. With the mammal-infesting species it is different, and in the case of the two Gyropid species of the guinea pig no evidence whatever was found indicating that the hairs of the host were used as food.

It is possible that Gyropids feed to a certain extent upon the blood of the host, yet the skin of a heavily infested guinea pig usually does not show any abrasions. Species of *Gliricola* with their sticking or cutting apparatus probably feed chiefly, as already stated, on serum as no blood was observed in the bodies of any of the lice of this genus.

Locomotion.—Most of the Gyropidae have each of the legs of the last two pairs modified into a hair-clasping apparatus (fig. 1). The second segment of the tarsus has become greatly lengthened, transversely striated and together with the reduced true tarsal claw, formed into a large, clawlike member which, when the leg is completely flexed, fits into a bootjack type of tenaculum at the base of the femur. This forked tenaculum is striated to match the tarsus, so that, as I have observed in living specimens of *G. ovalis*, when the latter is pressed between the forks it is held locked. I have observed that when individuals are at rest that they "cast anchor" by locking at least one of the hair-clapsing legs about a hair. Through the binoculars I have studied the locomotion of *G. ovalis* and find that it usually clasps during walking movements at least two hairs. The last two legs on a side work together, usually as the fingers on a single hand, but independently of the opposite legs of the same pairs. *G. ovalis* never walks backward and, on a smooth surface, is practically helpless.

In *Gliricola porcelli* and a few other species the tarsi are greatly reduced and the tarsal claws are wanting. In this species the hair-

clapsing device again consists of the modified last two pairs of legs, but the modification is entirely different from that in *Gyropus*. The last two pairs of legs have their tibiae and femora curved and transversely striated, and by means of the legs on one side opposing those on the other side, individuals were observed to clasp the larger hairs of their host. When small hairs are clasped the tibia itself functions as a large claw and holds the hair tightly by means of pressure against the femur. By observing individuals under the binoculars they could be seen to move rapidly either up or down a hair, and with some hesitancy from one hair to another. *G. ovalis*, on the other hand, works itself with ease across the hairs of its host. With *G. porcelli* locomotion takes place either forward or backward, and with almost equal facility, but not sideways. They can crawl either way on a smooth glass surface. This species has so adapted itself to resting and crawling on a single hair that we

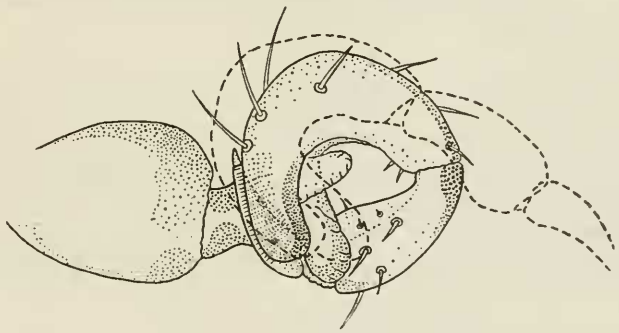

FIG. 1.—MONOGYROPUS LONGUS. LEG II SHOWING TARSUS LOCKED IN THE FURROWED CROTCH OF FEMORAL TENACULUM. DOTTED LINES SHOW POSITION OF LEG WHEN EXTENDED.

observe not only its remarkable slimness of body but also a median groove, "hair furrow," on the ventral side of the abdomen.

Response to temperature.—Clips of hairs infested with *G. porcelli* were taken and placed in watch glasses. In a few minutes the lice became restless and in less than an hour all had left the hair tufts. When these wandering individuals were placed again on the guinea pig they immediately, without exception, scrambled between the hairs and went down next to the skin of the host. Was this a response to the animal heat of the host?

The fact that the lice on the guinea pig remain so constantly next to or near the skin indicates again that the warmth of the body attracts them, yet we are not warranted in concluding that this is the case without a demonstration under experimentally controlled conditions.

Mating.—A broad individual which was taken to be a specimen of *Gyropus ovalis* was observed on a guinea pig and removed with a

tuft of hair for observation under the binocular microscope. It proved to be a large female specimen of *G. porcelli* with two males holding on to her. One male was on each side, and both of them were clasping the female with the two posterior pairs of legs. The female was apparently but little inconvenienced by her heavy load and moved easily about up and down the hairs.

One of these males was observed in an unsuccessful attempt to mate with the female. The genitalia with its ejaculatory sac was protruded and held extended for a few seconds, but no connections being made, was easily and quickly withdrawn.

What appeared to be a normal mating was observed through the binoculars on the host itself. The male clasped the abdomen of the female with his two posterior legs from below, holding himself under the female and his head under her thorax. In this position he interfered very little with the locomotion and general activities of the female, she packing him with facility as she crawled about in the fur of the host.

DESCRIPTIONS OF SUBFAMILIES, GENERA AND SPECIES.

In the following pages descriptions are given of the three subfamilies and nine genera, which the writer recognizes as belonging to the family, and of all the species represented in the combined Washington collections. Mention is made also of the known remaining species, and they are in nearly every case given in the keys.

KEY TO SUBFAMILIES AND GENERA.

a^1. Palpi composed of three segments; tarsi normal_____ **PROTOGYROPINAE.**
Contains but one genus_____**Protogyropus**, new genus.

a^2. Palpi two, or four segmented; at least one of the two posterior pairs of legs modified so that each leg of a pair forms a hair-clasping apparatus.

b^1. Palpi four segmented; second tarsal segment of second, and sometimes the third pair, of legs much enlarged, clawlike and transversely striate; femora of same legs each with a large, posterior, basal protuberance which is forked and transversely striated for the reception of tarsus_____**GYROPINAE.**

c^1. Tarsus I provided with a single claw.

d^1. Femur of leg III without forked and striated tenaculum for holding tarsus; second segment of tarsus III not transversely striate_____**Monogyropus**, new genus.

d^2. Femur of leg III with tenaculum and tarsus III transversely striate.

e^1. Most of abdominal segments provided dorsally with one or two transverse rows of subequal setae.

f^1. Typically each abdominal segment with two transverse rows of dorsal setae_____**Gyropus** Nitzch.

f^2. Typically each abdominal segment with a single transverse row of dorsal setae____**Allogyropus**, new genus.

e^2. Abdomen with but few setae above, some of which are large and in longitudinal rows, four such rows are always present_____Tetragyropus, new genus.

c^2. Tarsus I provided with two claws.

d^1. Tibia I swollen on its inside near its tip into a more or less thumblike tubercle; tarsus I with first and second segments about equal_____Macrogyropus, new genus.

d^2. Tibia I not swollen into any thumblike tubercle near its tip; tarsus I with segment I twice as broad as long and about half as long as segment II_____Heterogyropus, new genus.

b^2. Palpi two segmented; second tarsal segment of second and third legs never clawlike, femur of same legs not provided with any forked tenaculum_____GLIRICOLINAE.

c^1. Anterior horns of hypopharyngeal chitinization unarmed. Paragliricola, new genus.

c^2. Anterior horns of hypopharyngeal chitinization each armed with a row of teeth at its tip_____Gliricola Mjöberg.

PROTOGYROPINAE, new subfamily.

The new subfamily here established is for a new genus, and is distinct from the other two subfamilies which the writer would recognize, in having three segments to the palpi and in having all the legs normal, *i. e.* adapted for locomotion only. The large hair-clasping legs of the second and third pairs found in so many of the members of the Gyropidae are in this subfamily simple and in no way modified for hair clasping.

It is desired that the palpi of all species of the family be carefully studied. Of those species observed by the writer all, except the one going into this new subfamily, appear to have either two, or four segmented palpi.

But a single genus included.

PROTOGYROPUS, new genus.

Head somewhat triangular in shape, without projecting temporal lobes. Prothorax broad, being almost as broad as the head and mesothorax. Tarsi all very similar, first segment broader than long and swollen on inner distal margin; second segment longer than broad; claw simple, strongly curved near the base and sharp at apex. Femora unarmed, simple, strongly curved on outer margin. Dorsal setae of abdomen for the most part arranged into four longitudinal rows; large lateral setae present on certain segments.

Genotype and its host.—Protogyropus normalis, new species, from *Cavia*, species, taken in Argentina.

This genus, based on a single species, is of special interest because of its evident primitive character as shown by the legs which have not developed special hair-clasping devices.

PROTOGYROPUS NORMALIS, new species.

Plate 1, fig. 1, and text figs. 2 and 3.

A medium-sized, rather poorly chitinized species. Head moderate, subtriangular; temporal lobes not projecting; antennal fossae fully one-half as long as head. Antennae rather short. Palpi (fig. 2) almost half as long as antennae; first segment ringlike and much broader than long, second segment equal to first in length but not so broad, distal segment slightly longer than two but only two-thirds as broad. Dorsally the head is sparsely clothed with setae including a posterior, transverse row of six long ones and two long setae on each temporal angle. Prothorax about three-fourths as broad as head and broadest near its anterior margin. Mesothorax more or less fused with metothorax, broader than prothorax and about twice as broad as long. Metathorax the broadest and largest thoracic segment, clothed above by a few setae which are mostly a continuation of the four longitudinal rows of the abdomen. Abdomen oval, broadest at the region of the fourth segment. Dorsally the abdomen bears four longitudinal rows of moderate setae, usually there being in each row three setae to a segment, these three setae increasing in length from before backward. The last two abdominal segments each bear a pair of large lateral setae. Legs moderate and similar, the first pair being smaller than the other two pairs. Tarsus I similar to the others, first segment rather indistinctly divided from the second which is longer and narrower than the first, claw slightly longer than segment two.

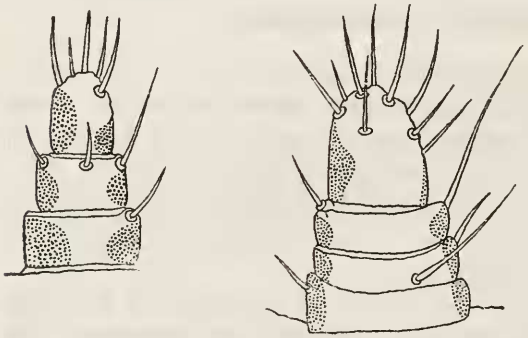

FIG. 2.—TO LEFT, PALPUS OF PROTOGYROPUS NORMALIS; TO RIGHT, PALPUS OF HETEROGYROPUS HETERONYCHUS.

Length, 1.02 mm.; width, 0.52 mm.

Type host and type locality.—Host *Cavia*, species (U.S.N.M. 236337: Biol. Surv. Collection) from Gen. Roca, Rio Negro, Argentina.

Type slide.—Cat. No. 23747, U.S.N.M.

Described from the following material: Three females from a skin of a female *Cavia*, species, (Cat. No. 236337 U.S.N.M.: Biol. Surv. Collection) taken November 23, 1920, at Gen. Roca, Rio Negro, Argentina, by A. Wetmore; two females from skin of female *Cavia*, species (Cat. No. 23640, U.S.N.M.: Biol. Surv. Collection) taken

November 26, 1920, at the same place by A. Wetmore; and one female from skin of male *Oryzomys*, species (Cat. No. 236273, U.S.N.M. Biol. Surv. Collection) taken November 7, 1920, fifteen miles south of Cape San Antonio, Province of Buenos Aires, Argentina, by A. Wetmore. The last record is probably that of a straggler.

GYROPINAE, new subfamily.

Species going into the old genus *Gyropus* Nitzsch are so diverse and widely distributed according to host species that they should be placed into several genera. Hence this old genus is here split into five genera, and there has been added also a new genus for a peculiar species which has the anterior tarsi two-clawed.

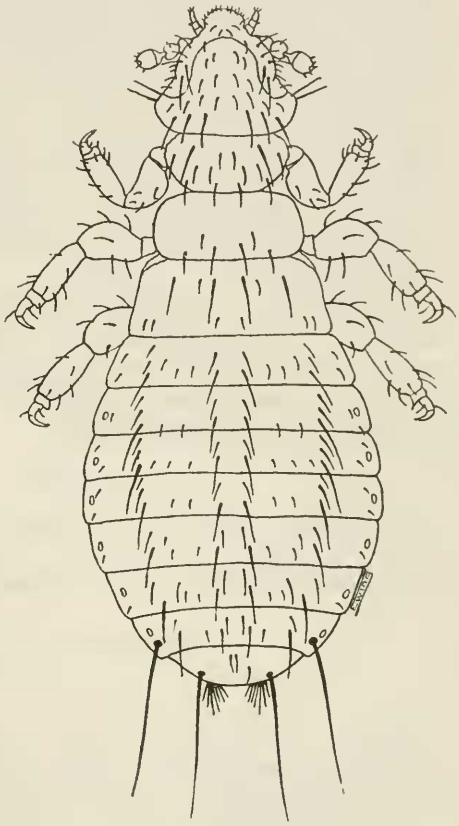

FIG. 3. — PROTOGYROPUS NORMALIS. DORSAL VIEW OF FEMALE, × 90.

The subfamily *Gyropinae* is separated from the subfamily *Protogyropinae* by the characters already given in the diagnosis of the latter family. It is at once separated from the other subfamily to be here established by always having the legs of the second and usually having the legs of the third pair, each modified so as to form a hair-clasping structure (fig. 1). This modification consists of an elongation and transverse striation of the second segment of the tarsus, which, together with the small terminal tarsal claw, forms a large clawlike structure adapted for fitting into a "bootjack" type of tenaculum on the femur. This femoral tenaculum is formed by a large divided tubercle at the base of the femur and is striate, or furrowed, in the same manner as the second segment of the tarsus. The *Gyropinae* are broad, stout lice and sometimes show a sexual dimorphism.

Contained genera.—*Gyropus* Nitzsch and five new genera to be here erected.

MONOGYROPUS, new genus.

Tarsus I provided with a single claw. Femur II provided with a forked and furrowed tenaculum for holding tarsus; femur III normal. Tarsus II with second segment greatly elongated and transversely furrowed and with the claw proper, which is greatly reduced, forming a clawlike structure adapted for fitting into femoral tenaculum; tarsus III with second segment clawlike but smaller and without transverse furrows. Tibia I without a row of toothlike setae on a swollen or thumb-like expansion at the inner distal margin. Abdomen elongate, typically each segment with two transverse rows of setae. Sexual dimorphism somewhat marked.

Genotype and host species.—Gyropus longus Neumann from *Abrocoma bennetti.*

Apparently only two species, the genotype and a new species, are included in this genus which is quite distinct on account of the peculiar nature of the last pair of legs. The genital armature of the male is usually large and well chitinized, with an expansive basal plate and strong parameres.

KEY TO THE SPECIES OF MONOGYROPUS.

a.[1] Body subrectangular; sides of abdomen almost parallel; total length over 1¾ mm. ---------- **M. longus** (Neumann).

a.[2] Body oval; abdomen swollen; total length not over 1½ mm.

M. parvus, new species.

MONOGYROPUS LONGUS (Neumann).

Text figs. 1 and 4.

A long, medium-sized, fairly well chitinized species. Head broad for such a long species; temporal lobes slightly projecting and at their angles bearing a tuft of setae; antennal fossae deep, more deeply notched on their ventral than on their dorsal margins; antennae of the usual shape being almost capitate. Above, the head is sparsely clothed with setae, including a posterior row of four which are much longer than the others. Prothorax in the female almost as broad as the head and with straight, parallel sides toward the front while toward the rear the sides converge rapidly; above, the prothorax is provided with several long setae, including two transverse rows of four each. In the male, prothorax shorter and on each side armed with a pair of stout, toothlike spines. Mesothorax not so broad as prothorax, and constituting the narrowest part of the body. Metathorax large, shaped like a truncated cone. The abdomen in the female much longer than the head and thorax combined; in the male about as long. In the female the sides of the abdomen are frequently subparallel, but in the male are more swollen. The abdomen is well clothed with long, stout setae. Geni-

tal armature of male large and heavily chitinized, basal plate shield-shape, parameres shaped like a pair of mandibles. Each pair of legs differently formed as is characteristic of the genus. Claw of tarsus I the largest, of tarsus II the smallest; claw of the last tarsus (fig. 4) about twice as long as claw of tarsus II. Tip of tibia III (fig. 4) provided with stout, flattened spines at its apex and below with an oblique row of three long spines. Femur II (fig. 1) semicircular, with a very large tenaculum, which is one-lobed in front and two-lobed behind.

Length of female, 1.67 mm.; width, 0.49 mm. Length of male, 1.54 mm.; width, 0.55 mm.

Type host and type locality.—Harrison (1916) gave *Abrocoma bennetti* as the type host of this species, notwithstanding the type specimen had not been selected. The specimen which Neumann had from *Abrocoma bennetti* is here designated as type, which designa-

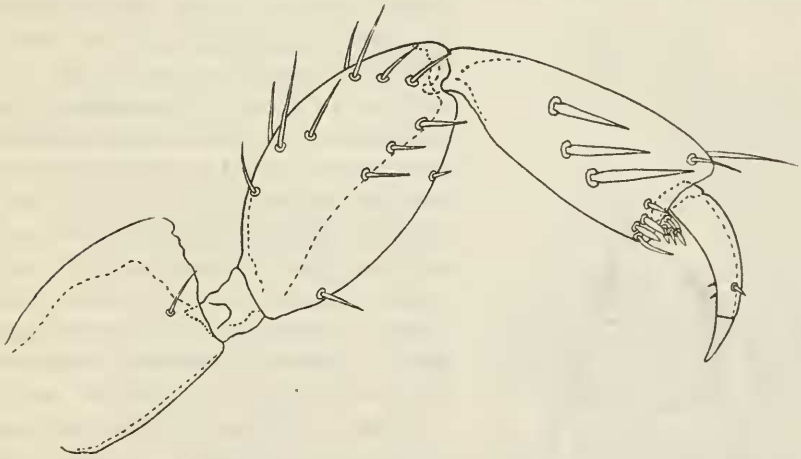

FIG. 4.—MONOGYROPUS LONGUS. LEFT POSTERIOR LEG FROM BELOW.

tion should fix this host as the type host. The host was taken in Chile.

Described from a large number of specimens mounted on four slides and determined originally by Paine as *Gyropus longus* Neumann. They were taken on *Abrocoma* from Valenar, Chile, by Porter. Neumann based his original description on a large number of specimens, for the most part females taken on "Ratones" at Peñaflor, Chile, by Porter and a single female from *Abrocoma bennetti*, Chile, by Trouessart.

MONOGYROPUS PARVUS new species.

Text fig. 5.

A small, pale louse. Head very broad, broader than long, with a transverse row of six very large dorsal setae on the temporal region. Antennae of the usual type, each about filling its fossa, last segment

a little more than half of a sphere, which is completed by the dilated part of segment III. Palpi moderate, last segment almost twice as long as next to last. Prothorax about three-fourths as broad as head, much broader than long and irregular in outline. Mesothorax shorter and narrower than the prothorax and representing the narrowest region of the body. Metathorax about as long as pro- and mesothorax combined, shaped like a truncated cone. Abdomen slightly swollen and moderately well clothed with flattened setae. Male genital armature (fig. 5) conspicuous; basal plate, long and pedicel-like; parameres (?). From near the apex of basal plate arise four pairs of very long, slender, curved seta-like structures which extend beyond the margin of the armature proper. Three pairs of legs differing as they do in the genus. Tibia II strongly arched on the outside and broadest at its middle; tibia III similar to tibia I, being broadest at its distal end. Tarsal claw I almost straight and sharp at its apex; tarsal claw II exceedingly short and minute, but very sharp; tarsal claw III fully twice as long as two, slender, but slightly curved, and also exceedingly sharp. Femoral tenaculum moderate but with a very deep fork, or crotch.

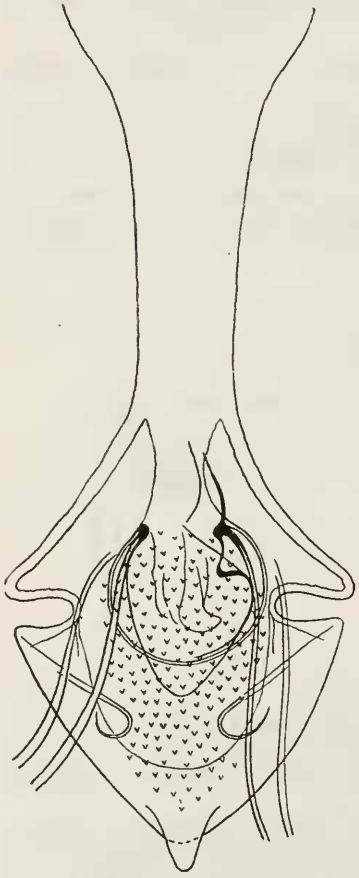

FIG. 5.—MONOGYROPUS PARVUS. COPULATORY APPARATUS OF MALE.

Length, 1.29 mm.; width, 0.43 mm.

Type host and type locality.—*Ctenomys colburni* from Huanuluan, Rio Negro, Argentina.

Type slide.—Cat. No. 23748, U.S.N.M.

Description based on the type, a male specimen from a female skin of *Ctenomys colburni* (Cat. No. 238122, U.S.N.M.) taken from Huanuluan, Rio Negro, Argentina. Another male specimen, taken from a skin of *Ctenomys sericeus*, male (Cat. No. 84192, U.S.N.M.), collected at Rio Chico, Santa Cruz, Argentina, appears to differ in no specific respect from the type.

Genus GYROPUS Nitzsch.

Head broad and very deeply notched in front of temples. Tarsus I provided with a single claw. Femur II and III each provided with

a forked and furrowed tenaculum for holding tarsus. Tarsus II and III each with second segment greatly elongated and transversely furrowed and with the claw proper, which is greatly reduced, forming a clawlike structure adapted for fitting into femoral tenaculum. Tibia I without a row of toothlike setae on a swollen or thumb-like expansion at the inner distal margin. Abdomen oval, typically each segment with two transverse rows of setae. Sexual dimorphism sometimes marked in case of male which has the first segment of tarsus I produced inwardly and formed into a thumb which with the accompanying claw forms a pair of claspers.

Genotype and its host species.—Gyropus ovalis Nitzsch from *Cavia cobaya* (guinea-pig).

In this genus are included seven species of the subfamily *Gyropinae*. Three of these, *G. ovalis* Nitzsch, *G. forficulatus* Neumann, and *G. alpinus* Kellogg and Nakayama have been described, the other four are new.

KEY TO THE SPECIES OF GYROPUS EXAMINED BY THE WRITER.

a.[1] Dorsal setae of abdomen minute, not over one-fourth as long as the segments on which they are situated.....**G. ovalis** Nitzsch.

a.[2] Dorsal setae of abdomen large, about as long as or even longer that the segments on which they are situated.

b.[1] Second and third pairs of legs essentially the same; tenaculum of leg III with a conspicuous tuberclelike lobe; tibia III from two to three times as long as broad.

c.[1] Tarsal thumb of male longer than the width of the segment it is a part of, but slightly curved and but little broader at its middle than at its tip.....**G. forficulatus** Neumann.

c.[2] Tarsal thumb of male not longer than the width of the segment it is a part of, strongly curved and much broader at the middle than at the tip.

d.[1] Tarsal thumb of male not as broad at its middle as at its base, moderately curved; a conspicuous chitinized penis present. **G. pollicaris**, new species.

d.[2] Tarsal thumb of male as broad at its middle as at its base and strongly curved; penis wanting..**G. latipollicaris**, new species.

b.[2] Third pair of legs more slender than the second, with femoral tenaculum greatly reduced and tuberclelike lobe small; tibia of leg III at least four times as long as broad; tarsal claw of leg III longer and sharper than the claw of leg II.

c.[1] Abdomen fully twice as long as broad and with sides subparallel. **G. gracilipes**, new species.

c.[2] Abdomen about one and a half times as long as broad, and oval. **G. wetmorei**, new species.

GYROPUS OVALIS Nitzsch.

Text fig. 6.

A medium-sized, short, oval species. Head (fig. 6) very broad; temporal lobes large and projecting, with a tuft of three or four setae at each angle. Antennae capitate, last segment spherical and

with a small sensory pit; antennal fossae deep and pronounced, the lower margin projecting beyond the upper and not so deeply notched. Near the posterior margin of the head is a transverse row of about 20 short dorsal setae. Slightly posterior of each temporal angle is a large seta, the largest on the head. Prothorax about two-thirds as broad as head and subdiamond-shaped, the lateral corners being rounded. Mesothorax fully twice as broad as long and intermediate in width between the head and prothorax. Metathorax broader than long, about as broad as head, and broadest at posterior margin. Abdomen almost twice as broad as long, the eight segments of almost equal length. Each of the first six segments of the abdomen with two transverse rows of small, subequal setae, the number of

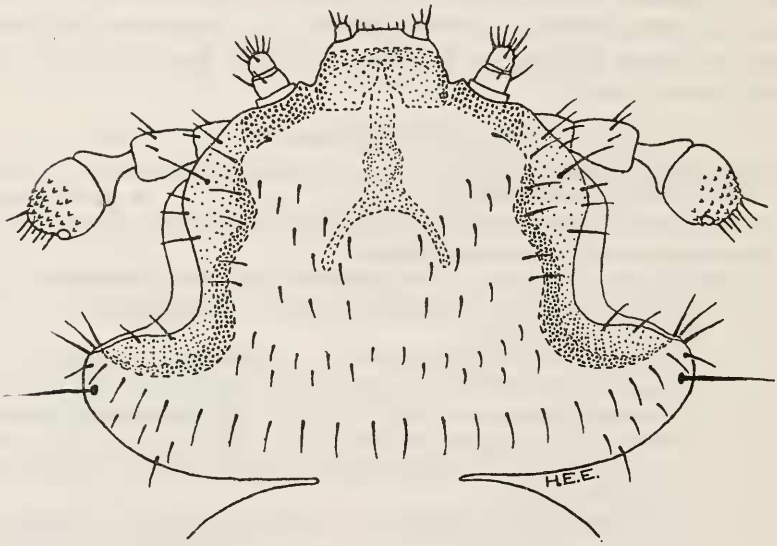

FIG. 6.—GYROPUS OVALIS. DORSAL VIEW OF HEAD.

setae in the posterior row being approximately twice that of the anterior row; seventh segment with the two transverse rows of dorsal setae, but their number is approximately equal in the two rows: last segment without transverse rows of setae but with two pairs of very long terminal setae. A single large pair of lateral setae to each abdominal segment. They increase in length with the backward sequence of segments. Gonopods semicircular in outline and scooplike and not as they are usually figured; each extends dorsally and inward, the inner dorsal margins extending beyond the posterior end of segment VIII. Each gonopod has its rim fringed with about a dozen setae; the two most ventral are minute, as also are the two most dorsal, while the intervening setae are large and increase in length toward the middle. Gential armature of male

compact and heavily chitinized; basal plate very long with straight, parallel sides; parameres clawlike, being outwardly hooked. Second and third pairs of legs practically identical; anterior fork of a femoral tenaculum simple, except for transverse striations, but posterior fork with a conspicuous, sharp, seta-bearing tubercle.

Length of female, 1.03 mm.; width, 0.52 mm. Length of male, 0.90 mm.; width, 0.35 mm.

Type host and type locality.—Cavia cobaya probably living under conditions of domestication.

Described from an abundance of material from various hosts. This species has followed its type host through the process of domestication and probably to all civilized countries of the world, but in nature is restricted with its host to the neotropical region. Records from hosts living in a natural state are here given. A male and female combed from a *Cavia* skin (Cat. No. 236344, U.S.N.M.: Biol. Surv. Collection) taken at Las Palmas, Chaco, Argentina, August 1, 1920, by A. Wetmore; several specimens representing both sexes from skin of *Cavia tschudi pallidior* male (Cat. No. 221015, U.S.N.M.), taken originally at Arequipa, Peru, by W. E. Castle; one female from a dragon fly (*Ischnogomphus jessei* Williamson) taken at Crestalina, Colombia, February 15, 1917, by J. H. and E. B. Williamson (Dr. W. M. Mann has published an article on the finding of this and other specimens of the same species on this dragon fly). Kellogg in his catalogue and host list published in Genera Insectorum in 1908 gives *Cavia cobaya* as the only host species. This is the only host mentioned by Mjöberg (1910), Neumann (1912), and Kellogg and Ferris (1915).

GYROPUS FORFICULATUS Neumann.

Plate 1, fig. 2.

A medium-sized stout species with conspicuous setae. Head about as broad as long; temporal lobes somewhat projecting; antennae rather larger than usual and completely filling the long deep antennal fossae; palpi small and not reaching the anterior margin of the large labium. Above the head bears a transverse row of six, large, subsequal setae on the temporal region. Prothorax about equal to the head in width, its anterior margin straight, lateral margin at first almost straight and subparallel, then about straight but strongly converging posteriorly. At the anterior corners of the prothorax is a pair of long curved setae; about half a dozen equally long setae are borne above. Mesothorax, which is not very distinctly separated from the metathorax, is much smaller and narrower than the prothorax, and constitutes the narrowest part of the body. Meta-

thorax with straight, posteriorly divergent sides, and about as large as the prothorax. Abdomen broad, oval, with serrate margins and well clothed, with large conspicuous setae. Gonopods of female low, inconspicuous but fringed with conspicuous setae, the inner two of which are stouter than the rest. Genital armature of male large, conspicuous and well chitinized; basal plate long and broad with straight sides that diverge posteriorly; parameres short and stout, mandiblelike. In the female, legs subequal; femoral tenaculum single-lobed ventrally and bilobed dorsally, with crotch conspicuously lined, or furrowed. In the male, front legs (pl. 1, fig. 2) larger than the rest and each provided with a clasper formed of the tarsal claw and a long thumb from the first tarsal segment. This thumb is fully as long as the claw, broadest at its base, and bears a single small seta near its tip.

Length of female, 1.58 mm.; width, 0.74 mm. Length of male, 1.50 mm.; width, 0.67 mm.

Type host and type locality.—From *Ctenomys*, species, Tucumán, Argentina.

Description based on two females and one male combed from a female skin of *Ctenomys opimus* (Cat. No. 121168, U.S.N.M.) from Oruro, Boliva. Neumann had a quantity of males and females collected on *Ctenomys*, species, from Tucumán, Argentina, by F. Lahille.

GYROPUS POLLICARIS, new species.

Plate 1, fig. 3.

Quite similar to *G. forficulatus* Neumann, but more slender and differing in several minor characters. Head as broad as long, with posterior margin almost semicircular; antennal fossae deep, ventral borders more deeply notched than dorsal; last segment of antenna with a straight lateral margin and broadly and evenly rounded inwardly and posteriorly; palpi conspicuous, each with its four segments clearly demarcated, second segment as broad as first. Prothorax not so broad as head and almost twice as broad as long. Mesothorax the narrowest region of the body. Metathorax with straight, posteriorly divergent sides. It is about equal to prothorax. Abdomen fully twice as long as broad and clothed with conspicuous setae. Male genital armature large, well chitinized and compact; basal plate over twice as long as its greatest width, its straight sides diverging posteriorly; parameres not mandible-like. Legs rather stout, the anterior pair of male slightly stouter than the others and with well-developed tarsal thumb. Tarsal thumb (pl. 1, fig. 3) as long as claw and gradually increasing in width from apex to base, laterally with two setae, the one near the apex being the smaller.

Tarsal claw slightly curved and with inner margin irregularly serrate toward the base.

Length of male, 1.81 mm.; width, 0.58 mm.

Type host and type locality.—*Ctenomys osgoodi* from near head of Rio Chico, Santa Cruz, Argentina.

Type slide.—Cat. No. 23749, U.S.N.M.

Described from a single specimen, the holotype, which is a male. This species differs from *G. forficulatus* in a number of characters, the more important of which are: The more slender body, the shorter and differently shaped tarsal thumb, the large palpi, and various differences in the genital armature of the male.

GYROPUS LATIPOLLICARIS, new species.

Plate 1, fig. 4.

Similar to *G. pollicaris*, but differing only in a few minor details. Temporal angles rather sharp; antennae large and in the case of female specimens frequently with the last two segments aborted or broken off; palpi rather large and with the four segments very pronounced. Prothorax with anterior margin almost straight, sides about straight and subparallel for a part of their length, then strongly converging to the posterior end of the segment. Mesothorax about twice as broad as long and with sides slightly diverging posteriorly. Metathorax scarcely as large as prothorax and with sides strongly divergent posteriorly. Abdomen fully twice as long as broad and sometimes more than twice as long. Gonopods of female vestigial but provided with the usual fringe of long setae. Male genital armature compact, conspicuous, and with large basal plate, the sides of which diverge slightly posteriorly. Legs nearly subequal in female, but in male first pair larger and stouter than the others. Thumb of tarsus I of male (pl. 1, fig. 4) much swollen and strongly curved and bearing near its tip three subequal setae.

Length of female, 2.00 mm.; width, 0.72 mm. Length of male, 1.97 mm.; width, 0.63 mm.

Type host and type locality.—*Ctenomys osgoodi* from Rio Chico, Santa Cruz, Argentina.

Type slide.—Cat. No. 23750, U.S.N.M.

Described from three females and three males on a male skin of *Ctenomys osgoodi* (Cat. No. 84160, U.S.N.M.) from Rio Chico, Santa Cruz, Argentina, and two males found on a female skin of *Ctenomys osgoodi* (Cat. No. 84165, U.S.N.M.) from Pacific slope, Chile, near head of Rio Chico, Santa Cruz, Argentina. It would hardly seem that two species so nearly related as *G. pollicaris* and *G. latipollicaris* should exist together on the same host, yet the differences in the tarsal thumb of the males are accompanied by several differences in the male genitalia of the two forms.

GYROPUS GRACILIPES, new species.

Text fig. 7.

A long slender species, with the posterior legs more slender than the middle ones. Head as broad as long; temporal lobes with rather sharp lateral angles. Antennae about filling the antennal fossae; inner margin of last segment longer than the outer and very strongly curved, outer margin almost straight, sensory pit conspicuous but not deep. Palpi not reaching the outer margin of labrum and with all four segments very distinct. Prothorax almost as broad as the head, anterior margin almost straight and lateral margins subparallel toward the front but strongly divergent posteriorly. Mesothorax about twice as broad as long and almost as broad as the prothorax, its sides diverging posteriorly. Metathorax about as broad and as long as the prothorax, its sides diverging posteriorly. Abdomen fully twice as long as broad, sides almost parallel and end of abdomen in female truncate. The abdomen is clothed with long conspicuous setae. Gonopods of female rudimentary, but each with the usual conspicuous fringe of setae, the two inner ventral of which are exceedingly minute, the third and fourth are stoutest, approximate and subequal. Genital armature of male conspicuous, compact, and well chitinized; basal plate long, with sides slightly concave and divergent posteriorly. In the female the first and second pairs of legs subequal, with the last pair smallest. First pair of legs of male the largest and the last pair the most slender. Tarsal thumb of male as in *G. latipollicaris*. Femur III longer and narrower than femur II and with the tenaculum greatly reduced; tibia III much longer and considerably narrower than tibia II; tarsus III (fig. 7) much more slender than II and with transverse striations much less pronounced; tarsal claw III considerably longer and sharper than tarsal claw II.

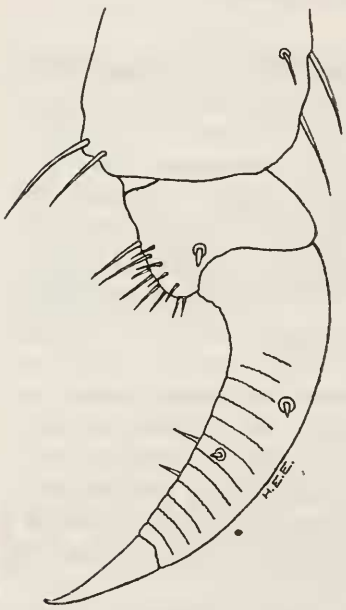

FIG. 7.—GYROPUS GRACILIPES. POSTERIOR VIEW OF TARSUS III.

Length of female, 1.69 mm.; width, 0.60 mm. Length of male, 1.68 mm.; width, 0.57 mm.

Type host and type locality.—*Ctenomys colburni* from Huanuluan, Rio Negro, Argentina.

Type slide.—Cat. No. 23751, U.S.N.M.

Described from four females and one male collected on a female skin of *Ctenomys colburni* (Cat. No. 238122, U.S.N.M.), taken at Huanuluan, Rio Negro, Argentina. This species is easily distinguished from all others in the genus on account of its long body and slender posterior legs.

GYROPUS WETMOREI, new species.

Text figs. 8 and 9.

A medium-sized, rather stout species. Head about as broad as long; temporal lobes somewhat projecting, with rounded angles; antennal fossae deep, but filled with antennae in repose, the latter somewhat stout with the last segment almost spherical except for the flat, truncate end; palpi large, extending to the front margin of labrum, the four segments very distinct. Dorsally near the posterior margin, the head bears a transverse row of six large setae. Prothorax almost as broad as the head, with anterior margin almost

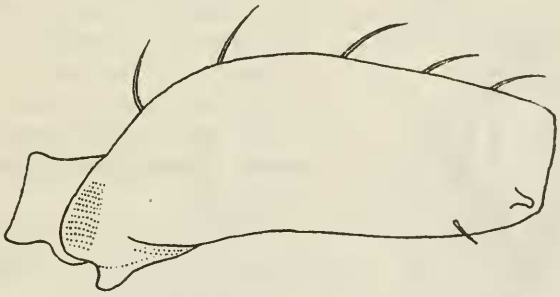

FIG. 8.—GYROPUS WETMOREI. POSTERIOR VIEW OF FEMUR III.

straight, from each anterior angle of prothorax there arises a large, curved seta. Mesothorax over twice as broad as long and almost as broad as prothorax; its sides strongly divergent posteriorily. Abdomen about two-thirds as broad as long and clothed with conspicuous setae. Gonopods, low semicircular ridges with a fringe of medium-sized setae. Legs almost equally stout, yet the posterior pair is observed to be more slender than the middle pair; femoral tenaculum of leg III (fig. 8) smaller than tenaculum of leg II; claw of tarsus III slightly longer than claw of tarsus II.

Length, 1.41 mm.; width, 0.55 mm.

Type host and type locality.—From male skin of *Ctenomys*, species (Cat. No. 236336, U.S.N.M.: Biol. Surv. Collection) taken at Tapia, Tucumán, Argentina.

Type slide.—Cat. No. 23752, U.S.N.M.

Description based on two females on type slide, which are a part of a lot of four females and five young taken from a skin of male *Ctenomys* (Cat. No. 236336, U.S.N.M.: Biol. Surv. Collection) collected at Tapia, Tucumán, Argentina, April 11, 1921, by A. Wetmore.

There is at hand also a lot from the same place by the same collector consisting of three females and one nymph taken on a male skin of *Ctenomys*, species (Cat. No. 236335, U.S.N.M.: Biol. Surv. Collection), April 9, 1921.

ALLOGYROPUS, new genus.

Head broad; antennal grooves not so broad as in other genera. Tarsus I provided with a single claw. Femur II and III each provided with a forked and furrowed tenaculum for holding tarsus. Tarsus II and III each with second segment greatly elongated and transversely furrowed and with the claw proper, which is greatly reduced, forming a clawlike structure adapted for fitting into femoral tenaculum. Tibia I without a row or toothlike setae on a swollen or thumblike expansion at the inner distal margin. Abdomen oval, typically each segment with one transverse row of setae. Sexual dimorphism slight or wanting.

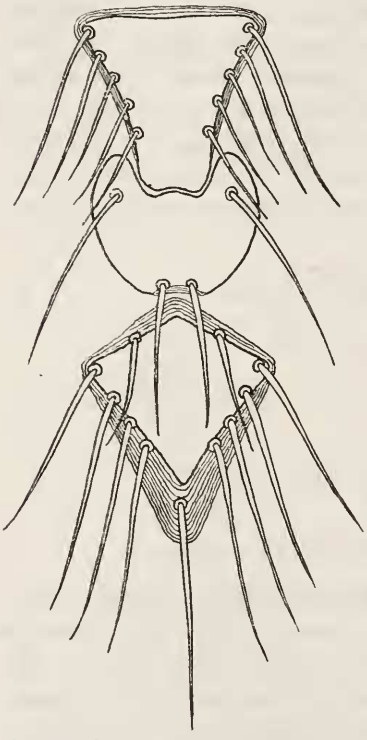

FIG. 9.—GYROPUS WETMOREI. STERNAL PLATES OF FEMALE.

Genotype and its host species.—*Gyropus amplexans* Neumann from *Dasyprocta aguti*.

The following species are included in this genus: *G. amplexans* Neumann, *G. setosus* (Neumann), and *G. turbinatus* (Piaget). The separation of the species which have but a single transverse row of dorsal setae to each abdominal segment from the others of the genus *Gyropus* has its justification, it is believed, in its analogy to the similar process by which certain genera of sucking lice are separated. Unfortunately the writer has never encountered any of the species of this genus. Neumann (1912) has separated them as follows in his key:

a.[1] Abdomen with hairs and setae very unequal_____**A. setosus** (Neumann).

a.[2] Abdomen with hairs and setae equal.

b.[1] Abdomen with rows of setae short, interrupted on the median line and toward the sides. Head much broader than long.

A. turbinatus (Piaget).

b.[2] Abdomen with rows of very short setae across the whole width of the segment. Head scarcely broader than long__**A. amplexans** (Neumann).

TETRAGYROPUS, new genus.

Head broad; temples broad and somewhat squarish. Tarsus I provided with a single claw. Femur II and III each provided with a forked and furrowed tenaculum for holding tarsus. Tarsus II and III each with second segment greatly elongated and transversely furrowed and with the claw proper, which is greatly reduced, forming a clawlike structure adapted for fitting into femoral tenaculum. Tibia I without a row of toothlike setae on a swollen or thumblike expansion at the inner distal margin. Abdomen oval, typically each segment without any transverse row of setae, the latter being arranged so as to form at least four longitudinal rows. Sexual dimorphism slight or wanting.

Genotype and its host species.—*Gyropus lineatus* Neumann from *Kerodon moco.*

Three species are for the present placed in this genus, but further study may necessitate the erection of a new genus for one of them which comes from a primate host. Contained species: *T. lineatus* (Neumann) and two species to be described in this paper.

KEY TO THE SPECIES OF TETRAGYROPUS.

a.[1] Mesothorax about equal in width to the prothorax; last segment of antenna longer than broad; tubercle of femoral tenaculum rounded.

b.[1] Accessory tubercle of femoral tenaculum large and conspicuous; segments three and four of abdomen without any long lateral setae.
T. lineatus (Neumann).

b.[2] Accessory tubercle of femoral tenaculum small; segments three and four of abdomen each with a pair of long lateral setae.
T. setifer, new species.

a.[2] Mesothorax much broader than prothorax; tubercle of femoral tenaculum very large, conspicuous and angulate----------T. aotophilus, new species.

TETRAGYROPUS LINEATUS (Neumann).

Head slightly broader than long; temporal lobes rounded, practically without angles; antennal fossae deep, posterior wall striate, inner margin of each fossa doubly emarginate hence somewhat E-shaped. Palpi almost reaching the anterior margin of labrum. Prothorax almost as broad as head, with sides strongly convergent posteriorly. Mesothorax about equal to prothorax in width and length but differently shaped. Metathorax broader than mesothorax and similarly shaped. Abdomen about twice as long as broad and with four longitudinal rows of straight setae, each seta extending to the base of succeeding seta, thus making four continuous lines across the abdomen. Long lateral setae, much longer than the dorsal setae, are on segments V, VI, and VII. Gonopods low and each with

a fringe of long, conspicuous setae. Treatment with potassium hydroxide shows that the abdomen is provided with poorly chitinized pleural plates; typically, one of these is narrow at its anterior end where the spiracle is situated and expanded and truncate at its posterior end, at which end is situated the large lateral hair. Anterior pair of legs much smaller than the others; second segment of tarsus I longer than usual and apparently forming a part of the tarsal claw; tarsal claw proper reduced and shortened. Femora II and III stout, each with a very large tenaculum; segment I of tarsus III as broad as long and forming with segment II and the tarsal claw, the large claw-like tarsus itself; at the base of segment II on the inside is a seta.

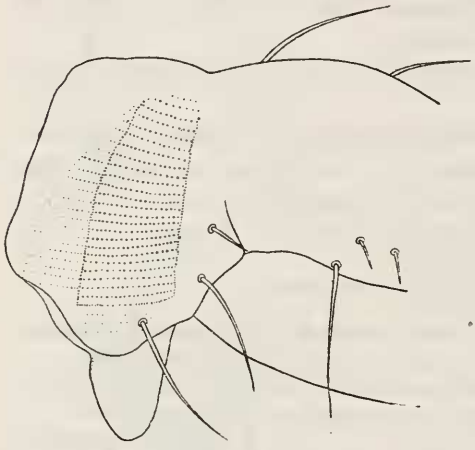

FIG. 10.—TETRAGYROPUS SETIFER. VENTRAL VIEW OF BASE OF FEMUR III.

Length, 1.34 mm.; width, 0.58 mm.

Type host and type locality.—*Kerodon moco* from Para, Brazil.

Description based on a female specimen on male skin of *Proechimys mincae* (Cat. No. 123490, U.S.N.M.) from Manzanares, Colombia. A young specimen taken on female skin of *Kerodon australis* (Cat. No. 84177, U.S.N.M.), from Upper Rio Chico, Santa Cruz, Argentina. Neumann described this species from some specimens taken on *Kerodon moco*, from Pará, Brazil, by Goeldi.

TETRAGYROPUS SETIFER, new species.

Text fig. 10.

A medium-sized, rather stout species. Temporal lobes without lateral angles; antennal fossae deep, each with inner border concave throughout. Antennae of the usual shape, last segment longer than broad, conspicuously scaled, and with a deep emargination on the outside. Palpi with the four segments very distinct; third segment almost as broad as first and nearly twice as broad as fourth segment; fourth, or last, segment slightly longer than broad and bearing several setae at its tip. Below, on the temporal region, the head bears on either side two approximate long setae and above a transverse row of six large dorsal setae, the outer pair being situated about twice as far from the middle pair as the inner pair. Prothorax three-fourths as broad as head, sides rounded toward the front and

then almost straight and converging posteriorly. Mesothorax not so broad as prothorax; metathorax about equal to prothorax in width. Abdomen sparsely clothed with setae, the largest of which are arranged into four longitudinal rows. Large lateral setae on segments III, IV, V, VI, and VII. Gonopods rudimentary but their setae unusually large, some of them being about as long as the lateral setae. Legs II and III subequal and each with the accessory tubercle of femoral tenaculum small (fig. 10). The front pair of legs is broken off of the single specimen at hand.

Length, 1.51 mm.; width, 0.55 mm.

Type host and type locality.—*Hoplomys gymnurus* from San Javier, Ecuador.

Type.—Cat. No. 23753, U.S.N.M.

Described from a single female, the holotype, combed from the skin of a male *Hoplomys gymnurus* (Cat. No. 113270, U.S.N.M.) from San Javier, Ecuador. This species is particularly differentiated from *T. lineatus* by the characters given in the key.

TETRAGYROPUS AOTOPHILUS, new species.

Text fig. 11.

Last nymphal instar.—Head broader than long; temporal lobes not evenly rounded; antenae short, last segment spherical; palpi with four segments distinct. Above, the head bears two transverse rows of setae; one of minute setae across the middle part of the head and one of very large, straight setae, eight in number, near the posterior border. Prothorax small, slightly over one-half as broad as the head and irregularly diamond-shaped; on its posterior border is situated a row of four large dorsal setae. Mesothorax large, equal to the head in length and width, sides diverging posteriorly; above, near the middle, is a pair of long setae and at each posterior corner is a large seta. Metathorax slightly broader than the mesothorax and about as long; above it has two pairs of lateral setae and several other smaller setae. Abdomen oval, almost as broad as long, provided above with four longitudinal rows of conspicuous setae, the setae of the two outer rows being smaller than those of the two inner, and two sublateral longitudinal rows of minute setae, there being a single seta to each abdominal segment. Lateral setae present on each abdominal segment except the last and almost enormous in size. Legs very stout, the anterior pair the smallest and the second and third pair subequal. In the case of either leg II or III the femur is very stout and short, and the tubercle of the femoral tenaculum is long, angulate and doubtless acts as a thumb in apposition to the tarsus, the tibia is bent into an elbow near its base, and the tarsus is very large and stout and

about equals the tibia in length. Tarsal claw of leg I almost straight except for curve near its base and very stout, tarsi II and III exceedingly small and stumpy, being about as broad at their bases as they are long.

Length of last nymph, 1.11 mm.; width, 0.47 mm.

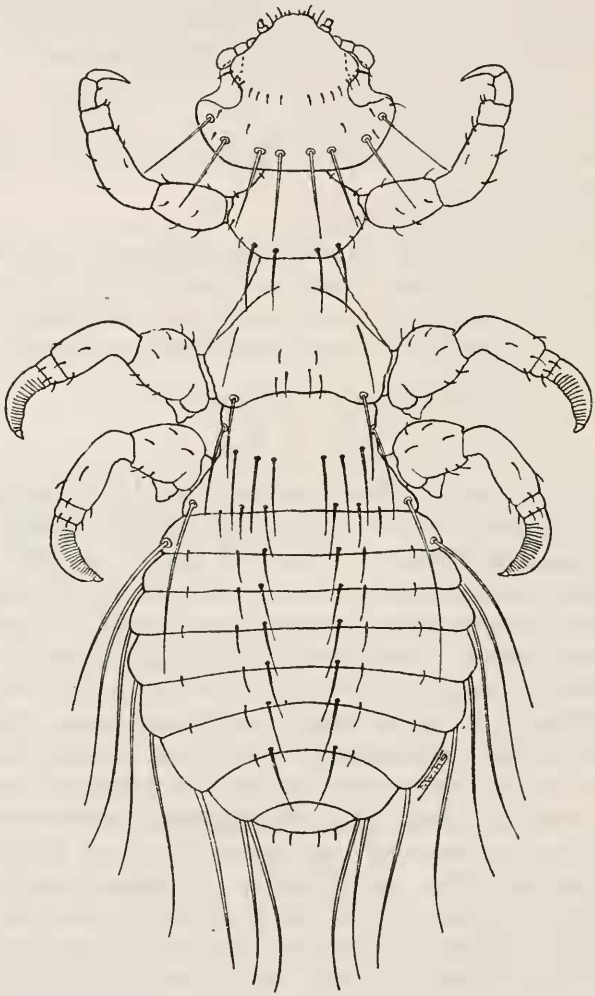

FIG. 11.—TETRAGYROPUS AOTOPHILUS. DORSAL VIEW OF NYMPH, × 100.

Egg.—About twice as long as broad and with a rather small operculum. Operculum circular, with a row of about a dozen nodular cells around its rim and the central area lifted into a domelike cone. Rim of opercular opening with a small flange. Cement attachment structure conspicuous; hair attachment sheath very long, being longer than the egg itself; free end of attachment sheath over twice

as long as cement cup; cement cup embracing less than a third of the egg surface.

Length of egg, 0.62 mm.; width, 0.35 mm.

Type host and type locality.—Aotes boliviensis from Bolivia.

Type.—Cat. No. 23754, U.S.N.M.

The descriptions here given, based on the last nymph and egg, would not, under ordinary conditions, be offered for a new species. However, the occurrence of a species of Gyropidae on a primate host is such an unexpected thing, and the evidence of its breeding on and infesting the monkey host is so conclusive, that the description of the species from a nymph seems justified. One specimen in good condition on skin of *Aotes boliviensis* (Cat. No. 3335, U.S.N.M.) taken in Bolivia by W. E. Moore some time before 1859. Locality not known but evidently from a tropical forested region. Not only was the louse found deep in the fur of the skin, but several nits were present, indicating the normal reproduction of the species on the monkey host of the family Cebidae.

MACROGYROPUS, new genus.

Tarsus I provided with two claws. Femur II and III each provided with a forked and furrowed tenaculum for holding tarsus. Tarsus II and III each with second segment greatly elongated and transversely furrowed and with the claw proper, which is greatly reduced, forming a clawlike structure adapted for fitting into femoral tenaculum. Tibia I with a row of toothlike setae on a swollen or thumblike expansion at the inner distal margin. Abdomen oval, typically each segment with one transverse row of setae. Sexual dimorphism slight or wanting.

Genotype and its host species.—Macrogyropus dentatus, new species from *Pecari angulatus crusnigrum* (Chiriqui collared peccary).

The two species included in this genus, *M. dentatus*, new species, and *M. dicotylis* (Macalister), are from American hogs or peccaries. They are both very large species, being much larger than the others of the family Gyropidae.

KEY TO THE SPECIES OF MACROGYROPUS.

a.[1] Tibia I with a swelling on the inside distally which is not thumblike and which is provided with a longitudinal row of toothlike setae; length not over 3 mm ..... M. dentatus, new species.

a.[2] Tibia I with a prominent thumblike process on its inner distal aspect; length of species over 3.5 mm ..... M. dicotylis (Macalister).

MACROGYROPUS DENTATUS, new species.

Plate 1, fig. 5.

Female.—Head broader than long; temporal lobes not evenly rounded; antennal fossae short and ending in a deep pit posteriorly: palpi with the four segments very distinct and not extending beyond the margin of the head. Antennae rather small for such a large species, third segment very distinct from the last which is almost cylindrical. Prothorax about three-fourths as broad as the head and much the broadest at its middle. Mesothorax about as broad as the head and with sides divergent posteriorly. Metathorax broader than the mesothorax and similarly shaped. Abdomen with swoolen sides and almost twice as long as broad; above each segment has a single transverse row of small, short setae and a pair of much larger lateral setae. Gonopods low and each with a fringe of about six or eight setae. Tibia I (pl. 1, fig. 5) with its inner distal border expanded into a lateral lobe which is fringed with a row of short, stout, subequal, toothlike setae. Tarsus I with first segment slightly curved and almost as long as broad, second segment longer than broad. Distally tarsus I bears two claws; the anterior, which is much the larger, is almost equal to segment II in length, evenly curved on the outside and slightly toothed on the inside; the posterior claw is not more than a third as long as the anterior one and is simple.

Length, 2.73 mm.; width, 1.15 mm.

Egg.—Very long, about three times as long as broad, and with non-opercular end free, not being encompassed by any cement cup. Operculum large, fringed on its circumference with a single row of nodular cells of which there are about three dozen, central area evenly rounded and smooth. Rim of opercular opening with slight flange. Cement attachment structure not conspicuous; hair attachment sheath never over two-thirds as long as the egg itself and without a free end; cement cup wanting, the egg being held entirely by cement adhering to its sides.

Length, 1.10 mm.; width, 0.45 mm.

Type host and type locality.—Pecari angulatus crusnigrum from Greytown, Nicaragua.

Type slide.—Cat. No. 23755, U.S.N.M.

Described from specimens on type slide except for the description of egg. The following material at hand: Four females, two young and two eggs on skin of *Pecari angulatus crusnigrum* (Cat. No. $\frac{16353}{23298}$, U.S.N.M.) from Greytown, Nicaragua, by Doctor Birt; one egg on skin. Cat. No. 12074, U.S.N.M., and three eggs on skin, Cat.

No. 12095, U.S.N.M. of *Pecari angulatus crusnigrum* from Talamanca, Costa Rica, 1874, by W. M. Gabb.

A further study of the lice of the peccaries is much to be desired. Nits of what is evidently an undescribed species of *Macrogyropus* occur on a skin of the Costa Rican white-lipped peccary (*Tayassu pecari spiradens*) in the United States National Museum.

HETEROGYROPUS, new genus.

Head very broad, about twice as broad as prothorax, and with deep antennal fossae. Tarsus I provided with two claws. Femur II and III each provided with a forked and furrowed tenaculum for holding tarsus. Tarsus II and III each with second segment greatly elongated and transversely furrowed and with the claw proper, which is greatly reduced, forming a clawlike structure adapted for fitting into femoral tenaculum. Tibia I without a row of toothlike setae on a swollen or thumblike expansion at the inner distal margin. Abdomen oval, typically each segment with one transverse row of setae. Sexual dimorphism probably wanting.

Genotype and its host species.—Heterogyropus heteronychus, new species, from *Kerodon spixii*.

This genus, with its single species, is of particular interest as it probably bridges over the gap between the one-clawed and two-clawed mammal infesting *Amblycera;* however, the accessory claw may not prove to be a real tarsal claw from the standpoint of homology; or, again, its presence may be due to regression, in which case the genus should not be considered as an intermediate one. In *Macrogyropus* the accessory claw is quite small, being almost vestigial.

HETEROGYROPUS HETERONYCHUS, new species.

Plate 1, fig. 6, and text figs. 2 and 12.

A medium-sized pale species. Head broader than long; temples projecting, without angles; antennal fossae broad and deep. Last two segments gone from both of antennae. Palpi with the four segments quite distinct, last segment about one and a half times as long as broad and reaching to the anterior margin of the labrum. Dorsally the head is sparsely clothed with small setae, many of which are arranged into a transverse row across the temporal region; two large setae are situated on each lateral margin of temples. Prothorax somewhat over one-half as broad as the head, about twice as broad as long and with sides rounded; mesothorax much broader than prothorax but scarcely as broad as the head; metathorax as long as mesothorax and slightly broader. Abdomen oval, about one and a half times as long as broad; each segment, except the last one, bears above a transverse row of short setae situated almost on

the posterior border and at each side a long lateral seta. Gonopods not well developed but fringed with conspicuous setae. Legs moderate, first pair smaller than the other two pairs which are subequal. Tarsus I (pl. 1, fig. 6) with first segment about twice as broad as long, second segment about twice as long as broad, curved and with five setae on its inside border, claws unequal, the ventral claw being only about one-half as long as the dorsal one, dorsal claw only slightly

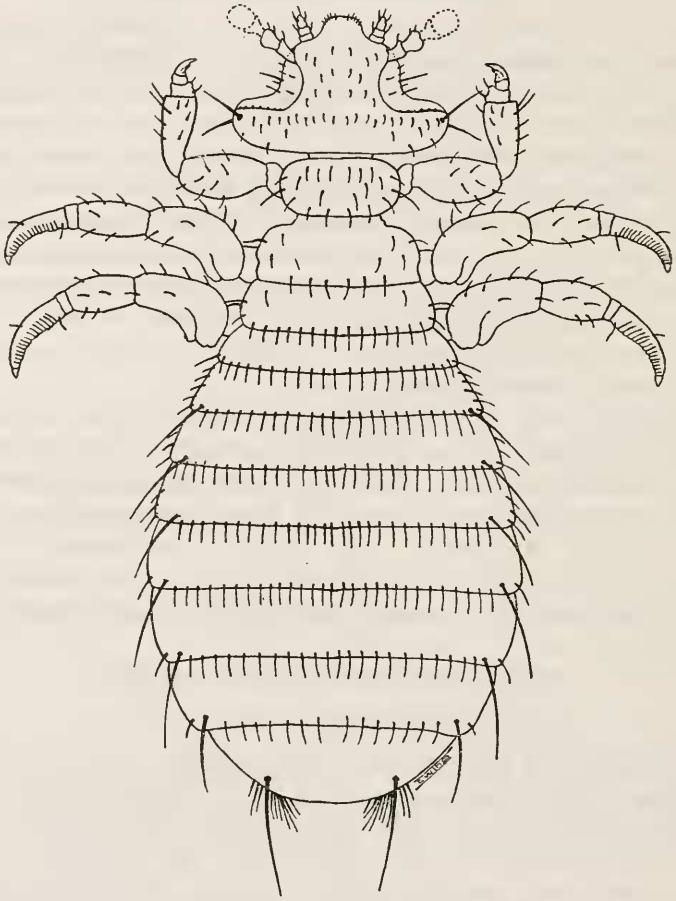

FIG. 12.—HETEROGYROPUS HETERONYCHUS. DORSAL VIEW OF FEMALE, × 90. (LAST TWO SEGMENTS OF EACH ANTENNA WANTING.)

curved and with a tooth below near its apex. Femora II and III long and each with well developed tenaculum; tibiae II and III but very slightly curved and broadest near their middle; tarsi II and III each formed into a clawlike structure which consists of first and second segments and the minute, terminal, true tarsal claw.

Length, 1.16 mm.; width, 0.50 mm.

Type host and type locality.—Kerodon spixii from Lamaras, Bahia, Brazil.

Type.—Cat. No. 23757, U.S.N.M.

Described from the holotype, a female specimen, complete and unbroken except for the antennae, on a female skin of *Kerodon spixii* (Cat. No. 123391, U.S.N.M.) from Lamaras, Bahia, Brazil, May 15, 1903, by A. Robert.

The relationship of this species to those of *Macrogyropus* which are found on American pigs (peccaries) is indicated not only by the presence of two claws on the front tarsus, but by the size and shape of the prothorax, by the shape of the meso, metathorax and the abdomen, but the size and arrangement of the body setae and, finally, by the similarity in the species in the last two pairs of legs.

GLIRICOLINAE, new subfamily.

Members of this subfamily are at once distinguished from all others by the very unusual character of the legs. The tarsi are greatly reduced, the tarsal claw is wanting and in its place is found a pulvilluslike appendage of the reduced second tarsal segment. The second and third pairs of legs are enlarged with the femora and tibiae curved and transversely striated. These legs are, as far as the writer has observed, used as hair-claspers, those on one side of the body apposing those on the other side, or the tibia of one leg acting in apposition to the femur of the same leg. The head, in keeping with the whole body, is long and slender, and below has two well-developed hornlike structures, that, according to Mjöberg, are capable of both longitudinal and lateral motion. These hornlike structures are the outer hypopharyngeal chitinizations and probably are used in cutting or piercing.

Contained genera.—Gliricola Mjöberg and a new genus to be here established.

PARAGLIRICOLA, new genus.

Body long and slender. Head longer than broad, with posterior margin semicircular; temples with a transverse row of setae; anterior horns of hypopharyngeal chitinization unarmed. Prothorax much smaller than meso-metathorax, and provided with a transverse row of minute, dorsal setae; meso-metathorax with two such transverse rows. Abdomen the broadest part of the body and with each segment, except the last, provided dorsally with a single, transverse row of exceedingly minute setae. Tarsi with second segment greatly reduced and clawless, but with a clawlike seta developed on the outer distal aspect.

Genotype and its host species.—Paragliricola quadrisetosa, new species, from *Cavia tschudii.*

Only a single species is included in this genus which differs from *Gliricola* fundamentally in its unarmed hypopharyngeal chitiniza-

tion. In *Gliricola* this chitinous structure is armed with teeth distally and along its inner margins is serrate.

PARAGLIRICOLA QUADRISETOSA, new species.

Plate 1, fig. 7, and text figs. 13 and 14.

A long, slender species. Head considerably longer than broad, posterior margin semicircular; antennal fossae very long and deep; antennae rather long, last segment subspherical with deep notch on outside and a conspicuous sensory pit; palpi extending beyond margin of head, second segment about twice as long as first and longer than broad. Prothorax much narrower than the head but broader than long; its sides rounded, and above near the middle is a transverse row of minute setae. Meso- and metathorax completely united into a single segment which is about as broad as the head, and as broad as long, and bears dorsally two transverse rows of minute setae. Abdomen about twice as long as broad and posteriorly bilobed; first segment longest, except for the modified last segment: each of the abdominal segments except the last with a transverse row of minute dorsal setae near the posterior margin and segments two and three each with a pair of long lateral setae. Each posterior lobe of abdomen flattened, expanded shelflike laterally beyond the lateral margin of the last segment, and posteriorly into a long tuberclelike process; lateral expansions each with two conspicuous subequal setae situated on the posterior margin and tuberclelike processes each with two terminal, subequal, narrow, leaflike setae, and dorsally at its base a long seta fully twice as long as

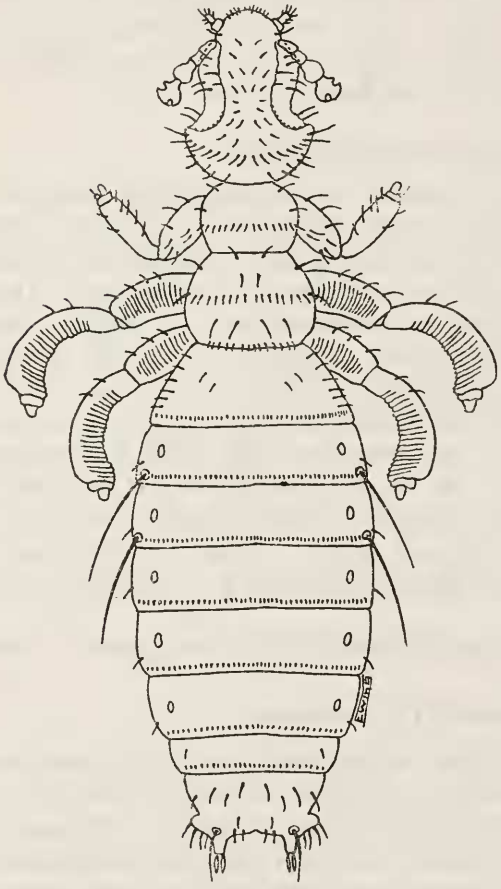

FIG. 13.—PARAGLIRICOLA QUADRISETOSA. DORSAL VIEW OF FEMALE, × 100.

the process itself. Gonopods large, conspicuous, almost as broad at tips as at their bases, and lying below lateral expansions of posterior lobes; each gonopod with three subequal terminal setae which are fully equal to the gonopod itself in length, and three smaller, unequal setae along the posterior margin; the posterior terminal seta and the three marginal setae are slightly flattened but are hardly foliaceous. First pair of legs much smaller than the others; tibia I (pl. 1, fig. 7) enlarged distally and provided along its inner distal margin with a row of minute setae; tarsus I (pl. 1, fig. 7) with first segment broader than long; second segment reduced and pulvilluslike, with a few transverse striations; on the inside and on the outside with a curved, clawlike seta situated on chitinous tubercle. The tibiae of the last two pairs of legs are more strongly curved than the femora.

FIG. 14.—PARAGLIRICOLA QUADRISETOSA. OUTER CHITINIZATIONS OF HYPOPHARYNX.

Length, 1.07 mm.; width, 0.30 mm.

Type host and type locality.—Cavia tschudii from La Raya Pass (4,267 meters, 14,000 feet), Peru.

Type.—Cat. No. 23758, U.S.N.M.

The holotype is a stained female specimen found on a female skin of *Cavia tschudii* (Cat. No. 194492, U.S.N.M.), from La Raya Pass, Peru. Two other female specimens are at hand which appear to agree in all particulars with the holotype. One is a female specimen from skin of female *Cavia* species (Cat. No. 236345, U.S.N.M.: Biol. Surv. Collection) taken at Guamini, Buenos Aires, Argentina, March 3, 1920, by A. Wetmore. The other is a female specimen found on a female skin of *Kerodon spixii* (Cat. No. 123391, U.S.N.M.), from Bahia, Lamaras, Brazil.

Genus GLIRICOLA Mjöberg.

Body slender. Head longer than broad, with posterior margin semicircular; anterior horns of hypopharyngeal chitinization armed at their apices with teeth and provided with serrate inner margins (fig. 15). Prothorax much smaller than the meso-metathorax. Typically each segment of the abdomen provided dorsally with a single, transverse row of minute setae. In female, abdomen two lobed. Second segment of tarsus somewhat like a pulvillus, soft and transversely striated and bearing no claw-like setae.

Genotype and its host species.—Gliricola porcelli (Linnaeus) from *Cavia cobaya* (guinea pig).

In this genus there are included besides the type a subspecies of the same, *G. porcelli perfoliatus* (Neumann), a new species to be described in this paper and probably the *Gyropus decuratus* of Neumann. It will be necessary to study the hypopharyngeal chitinizations of this latter species before its generic affinities can be ascertained with certainty.

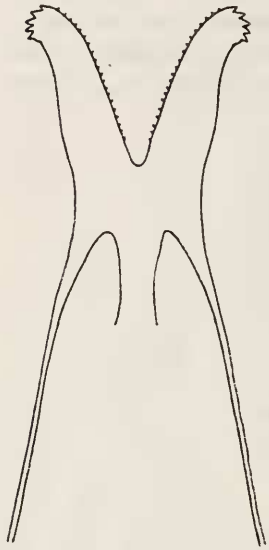

FIG. 15.—GLIRICOLA PORCELLI. OUTER CHITINIZATIONS OF HYPOPHARYNX.

KEY TO SPECIES OF GLIRICOLA.

a.[1] Lateral chitinizations of basal plate of female genital armature thickened; male genital armature with parameres strongly curved and claw-shaped endomeres present.
G. distincta, new species.

a.[2] Lateral chitinizations of basal plate of female genital armature more slender; male genital armature with almost straight parameres and no well-chitinized endomeres.
G. porcelli (Linnaeus).

GLIRICOLA DISTINCTA, new species.

Text fig. 16.

Head longer than broad, with posterior margin semicircular; antennal fossae long and deep, its inner margin with three emarginations; antennae each with last segment greatly swollen and pedicellate, its anterior margin with a great notch and its tip truncate. This last segment is scaled, from its truncate tip there arises five straight setae, and situated at this tip is the large sensory pit. Palpi extending beyond the margin of the head by the full length of the last segment, which is about twice as long as broad. Prothorax almost as broad as the head and about twice as broad as long. Mesothorax entirely fused with metathorax; this combined segment is slightly longer and slightly broader than the prothorax. Abdomen from two or three times as long as broad, being bigger and stouter in the female than in the male, first segment longer than the others, except for the last. Gonopods semicircular and scooplike and practically continuous with the posterior abdominal lobes. The setae on a single gonopod are as follows from the front backward: First, at the base of the gonopod, is a simple, curved seta; next comes two subequal narrow foliaceous setae slightly longer than the simple seta; lastly, are three broader and longer foliaceous setae, each of which ends in a slender spine. Each gonopod ends in a hyaline plate which extends beyond the abdominal lobes. Abdominal lobes low and each terminated by a pair of approximate foliaceous setae.

Genital armature of male very long and slender; basal plate extending forward to the middle of fourth abdominal segment, broadened at its base and narrowest at its middle: parameres slender, curved outward and truncate at their attenuated tips. Each paramere with a small spine at about one-fourth its length from the tip and two smaller, divergent ones at its tip.

Length of female, 1.25 mm.; width, 0.27 mm. Length of male, 1.09 mm.; width, 0.22 mm.

Type host and type locality.—*Cavia anolaimae* from Paramo del Sancturio, Boyaca, Colombia.

Type slide.—Cat. No. 23759, U.S.N.M.

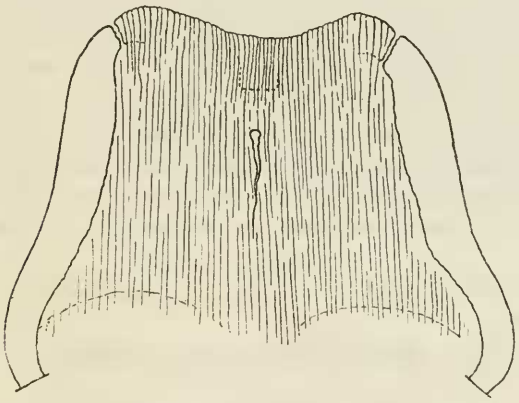

FIG. 16.—GLIRICOLA DISTINCTA. BASAL PLATE OF FEMALE GENITAL ARMATURE.

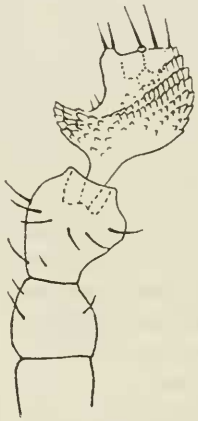

FIG. 17.—GLIRICOLA PORCELLI. LEFT ANTENNA FROM BELOW.

Described from four females and two males on a skin of *Cavia anolaimae* (Cat. No. 236907, U.S.N.M.) from Paramo del Sancturio, Boyaca, Colombia, September, 1920.

The *Gliricola* forms that occur on the different *Cavia* species are so much alike that it is hard properly to detect individual variations from those correlated definitely with a host relationship. The form from *C. anolaimae* is different, however, in this respect as it differs from those on *C. cobaya*, *C. tschudii*, *C. cutleri*, and *C. rufescens* in several characters of the genitalia as has been indicated in the key to two of the species of *Gliricola*.

GLIRICOLA PORCELLI (Linnaeus).

Plate 1, fig. 8, and text figs. 15 and 17.

Head longer than broad, posterior margin rounded; antennal fossae long and deep; antennae (fig. 17) moderate, last segment pedicellate, its capitate portion rounded at the base, truncate distally and laterally with a deep excavation. This last segment is conspicuously scaled and has about five terminal setae; palpi extending beyond the margin of head by about the full length of last segment. Outer

hypopharyngeal chitinization (fig. 15) with anterior horns strongly divergent, each provided distally with five teeth and along its inner margins with minute serrations. Prothorax almost as broad as head; mesothorax and metathorax completely united and together a little longer and a little broader than the prothorax. Abdomen more slender in the male than in the female; first segment apparently divided into two by the presence of two transverse rows of dorsal setae. If this apparent division of the first segment were considered a real one the actual number of abdominal segments would be nine instead of eight. Genital armature of female as in *G. distincta* except the lateral chitinizations, or apodemes, are stouter. Male genital armature reaching the posterior border of third abdominal segment; basal plate not broadened at its base and with sides parallel; parameres almost straight except near their distal ends, each paramere rounded at its tip where are situated three minute setae. Legs about subequal; tarsus I (pl. 1, fig. 8) with first segment about as broad as long and distal segment soft, pulvilluslike with transverse lines; at the base of second tarsal segment are two seta-bearing tubercles, one being on the inside and one on the outside. These setae are straight.

Length of female, 1.18 mm.; width, 0.3 mm. Length of male, 1.03 mm.; width, 0.27 mm.

Type host and type locality.—From *Cavia cobaya*, probably in a state of domestication.

Description based on many specimens from four different species of *Cavia*. Kellogg (1908) gives only *Cavia cobaya* as a host for this species, all records coming evidently from domesticated animals. Mjöberg (1910) reported, "*Einige Exemplare von Cavia cobaya (ipse) und von 'einem schwarzen Meerschwein.'*" Neumann (1912) described a new subspecies of *G. porcelli* from *Kerodon moco* collected at Pará, Brazil. This subspecies may prove to be a good species. The writer has not seen examples of it. The material in the United States National Museum, exclusive of collections from the domestic guinea pig, are as follows: A female and nymph on *Cavia tschudii* (female) from La Raya Pass, Peru, November, 1915; four females and a transforming male, determined by Paine as *G. bicaudatus*, on *Cavia cutleri*, from Peru, by Castle; several specimens from *Cavia rufescens* in the same cage with *C. cobaya*, October 2, 1912; three females from *Cavia tschudii pallidior* (male) (Cat. No. 221015, U.S.N.M.) which died in 1919 at the National Zoological Park, Washington, D. C., the animal being originally taken at Arequipa, Peru, by W. E. Castle.

GEOGRAPHICAL AND HOST DISTRIBUTION.

The family Gyropidae is probably the most interesting in its geographical and host distribution of all the families of the order

Mallophaga. This is because of its apparent restriction to a single zoogeographical region, while its evident host distribution is on large taxonomic groups that have almost a worldwide distribution.

FIG. 18.—CHART SHOWING THE GEOGRAPHICAL DISTRIBUTION OF THE GYROPIDAE.

GEOGRAPHICAL DISTRIBUTION.

If we except a single record from Europe, all others, that are from hosts existing in a state of nature, come from the neotropical region. The extent of the distribution of the Gyropidae is indicated by the accompanying map (fig. 18), which shows records as far south as southern Argentina and as far north as Nicaragua, as far west as

the Pacific slope of the Andes and as far east as the Atlantic coast. These records indicate that the geographical range of the family is practically coextensive with that of the neotropical region.

Vertically, specimens have been taken from practically sea level along the coast of the Province of Buenos Aires, Argentina, up to La Raya Pass, 4,267 meters (14,000 feet), in Peru. The extreme record for this elevation for a species on a cavy, *Cavia tschudii*. Since apparently all species of cavies are infested with Gyropids, and these rodents are known to range from sea level to this altitude of 4,267 meters, it may, with a high degree of probability, be inferred that the Gyropidae have this great vertical range.

The single record from Europe for *Allogyropus turbinatus* (Piaget) on *Arctomys marmotta* is to be questioned, as being an authentic one for the host species and locality of this louse. The host given is a Sciurid, and not only is this the only host species ever reported for this family of rodents, but the extensive examinations of the rodents of the family Sciuridae by several workers have failed to reveal any infesting Gyropidae. It should also be noted that up to the present no records of Gyropids from Sciurid hosts have been made in the neotropical region where these mammals extend far into the range of the Gyropid parasites.

HOST DISTRIBUTION.

More remarkable than the restriction of this Mallophagan family in its geographical distribution to a single region is its extension in its host distribution to diverse mammalian groups. These groups include certainly three different orders, and possibly four, the orders being: Edentata, Rodentia, Primates, and Ungulata. One of these orders, the Rodentia, however, includes the vast majority of the species; while of the remaining orders Ungulata has two species; Primates, one, and Edentata possibly one. Not only is the family Gyropidae concentrated chiefly on rodents but even in this order it is found only on four or possibly five or six families. It is on the Caviidae and the Octodontidae that the Gyropidae find their most favored hosts, members of these two families frequently supporting two or even three Gyropid species.

That Gyropids normally infest edentates should be questioned. The single record of *Gyropus hispidus* Nitzsch from the sloth, *Bradypus tridactylus*, is based upon a single specimen from a dried skin. In order to establish, if possible, the validity of this record the writer has gone over the entire collection of several scores of sloth skins in the United States National Museum. During all this search not a single louse or nit was found. Added to this negative evidence is that given by Dr. W. M. Mann, who during his trip with the Mul-

ford Expedition to South America, observed live sloths, several of which were killed and examined for lice but with negative results.

A survey also of the records for the different host families causes us to accept with very much reservation the records for two host species belonging to the order Rodentia. The single record from the Sciurid host has already been discussed. There remains for consideration the record of *Protogyropus normalis* Ewing from a species of *Oryzomys*, a member of the family Muridae. This record is based upon the obtaining of a single specimen from a recently dried skin. Although many other Murid skins, taken from the same region in South America and at the same time, were examined, no other Gyropids were obtained. On the other hand this same louse was taken in some numbers from two *Cavia* skins, thus, here is an indication of its true host relationship.

SIGNIFICANCE OF THE GEOGRAPHICAL AND HOST DISTRIBUTION.

After excluding these questionable records we are confronted with the following facts in regard to the known distribution of the species of Gyropidae. First, it is a group of a clear-cut, restricted geographical range; second, it is one with a marked and restricted preference as to host groups; third, at the same time also it is a group that is maintaining itself in nature on distantly related mammalian orders. The fact that only a very few of the species, as far as known, have successfully established themselves on indigenous representatives of distantly related orders indicates that in the phylogeny of these host orders there has been a crossing over of the ectoparasites from their most favored group, the Rodentia, to the less favored ones, the Primates and Ungulata. That the presence of Gyropidae on Primates and Ungulata is to be thus explained is further indicated by the fact that the Old World Primates and Ungulata, as well as the Nearctic Ungulata, are, to the best of our knowledge, without Gyropid lice. If their presence is to be explained by the parallelism in descent of host and parasite, certainly the neotropically exotic Primates and Ungulata should also have these gyropid species; but they do not harbor them, at least to the best of our knowledge.

Would it not be hard to get a better accumulation of circumstantial evidence for the "crossing over" of a parasite group from what is apparently its original and favored host group to others having no phylogenetic relationship to the former? But if we grant that this "crossing over" has taken place, how are we best to explain it? Evidently in the case of small wingless animals the first requirement for such a transfer would appear to be the coinhabiting of the same area by the different nonrelated host groups. This condition obtains. Next, in the case of ectoparasites provided

with clinging organs in the form of hair claspers, there must be a close approximation in the physical element of the louse environment as is afforded by the pelage. Finally, the food requirements and other elements of the environments for the lice of the two host groups must approximate. A superficial examination of these conditions shows that in some of these respects some of the primates and ungulates do approximate the Caviidae and Octodontidae. Former existing species of these groups probably did so even to a greater degree.

The pelage of some mammals is of such a nature as to constitute a physical barrier to the transfer to them of such hair-clasping lice as the Gyropidae. The fur of a mole or shrew, for example, is so fine and the hairs so dense that such lice would find it physically impossible either to progress between the hairs or to clasp them effectively with their modified hair-clasping legs. Other mammals, the porcupines or some of the larger ungulates, for example, have the pelage so coarse as to present a great obstacle to the crossing over of small lice with their hair-claspers adapted for holding only medium-sized hairs.

Although the different mammalian groups through the processes of their development have arrived at their present day positions of great diversity in morphology and habits, anyone who has examined the skins of these mammalian groups has noted cases of most excellent convergence in regard to the pelage type. Take the echidnas and the porcupines and certain of the spiny rats, for example, they all have developed the long, rigid, exceedingly sharp-pointed, quill type of pelage, each quill being only a modified hair of enormous proportions. Undoubtedly these quills serve in the main the same purpose in all three groups, and they have in each instance been developed in the same way, yet from what diverse phylogenetic groups. If there is such remarkable convergence in the physical elements of the fur environment, why not in the other elements? Data in respect to these other elements unfortunately as yet have not been obtained in any comprehensive way. However, it should be noted that in the physical and chemical properties of the blood, mammalian species of diverse groups frequently show an unusual similarity.

As the forest is to a monkey, the pelage of a mammal is to a louse. Both furnish the physical background for these two respective kinds of inhabitants. In these environments are to be sought food, shelter, and the necessaries for growth, reproduction, and dissemination. Given a convergence in different forest environments a possibility is presented of their being inhabited by the same groups of forest mammals. Similarly, given a convergence in different pelage environments on the backs of mammals we would expect, and sometimes

do get, the writer believes, an infestation with the same group of ectoparasites.

The convergence of the pelage environment of the two diverse mammalian groups is a necessity to the crossing over of many ectoparasites from the one to the other. That such a crossing over does occur in nature, we have an abundance of evidence, and particularly in the case of the mallophagan family Gyropidae do we have the data indicating in most convincing terms that they have jumped the phylogenetic gap between the order Rodentia and the orders Primates and Ungulata, going from their original and most favored rodent hosts to the less favored primate and ungulate hosts.

HOST LIST.

EDENTATA.

Bradypodidae.

Bradypus tridactylus (sloth).
Gyropus hispidus Nitzsch.[1] (South America.)

RODENTIA.

Caviidae.

Cavia anolaimae.
Gliricola distincta Ewing. (Colombia.)
Cavia cobaya (guinea-pig).
Gyropus ovalis Nitzsch. (Everywhere the host is kept in domestication.)
Gliricola porcelli (Linnaeus). (Everywhere the host is kept in domestication.)
Cavia cutleri.
Gliricola porcelli (Linnaeus). (Peru.)
Cavia rufescens.
Gliricola porcelli (Linnaeus). (Straggler?)
Cavia tschudii.
Gyropus ovalis Nitzsch. (Peru.)
Paragliricola quadrisetosa Ewing. (Peru.)
Gliricola porcelli (Linnaeus). (Peru.)
Cavia, species.
Protogyropus normalis Ewing. (Argentina.)
Cavia, species.
Paragliricola quadrisetosa Ewing. (Argentina.)
Kerodon australis.
Tetragyropus lineatus (Neumann). (Brazil.)
Kerodon moco.
Tetragyropus lineatus (Neumann). (Brazil.)
Gliricola porcelli perfoliatus (Neumann). (Brazil.)
Kerodon spixii.
Heterogyropus heteronychus Ewing. (Brazil.)
Paragliricola quadrisetosa Ewing. (Brazil.)

[1] This species belongs to the subfamily *Gyropinae*, but its inclusion in the genus *Gyropus* is only tentative. The record is to be questioned. (See discussion under Geographical and Host Distribution.)

CHINCHILLIDAE.

Lagidium peruanum.
Gyropus alpinus Kellogg and Nakayama. (Peru.)
Lagotis cuvieri.
Gyropus lagotis Gervais.[2] (Chile.)

DASYPROCTIDAE.

Dasyprocta agouti.
Allogyropus amplaxans (Neumann). (Brazil.)
Gliricola (?) *longicollis* (Nitzsch).

MURIDAE.

Oryzomys, species.
Protogyropus normalis Ewing.[3] (Argentina.)

OCTODONTIDAE.

Abrocoma bennetti.
Monogyropus longus (Neumann). (Chile.)
Abrocoma, species.
Monogyropus longus (Neumann). (Chile.)
Ctenomys colburni.
Monogyropus parvus Ewing. (Argentina.)
Gyropus latipollicaris Ewing. (Argentina.)
Gyropus gracilipes Ewing. (Argentina.)
Ctenomys opimus.
Gyropus forficulatus Neumann. (Bolivia.)
Ctenomys osgoodi.
Gyropus pollicaris Ewing. (Argentina.)
Gyropus latipollicaris Ewing. (Argentina, Chile.)
Ctenomys sericeus.
Monogyropus parvus Ewing. (Argentina.)
Ctenomys, species.
Gyropus wetmorei Ewing. (Argentina.)
Ctenomys, species.
Gyropus forficulatus Neumann. (Argentina.)
Dactylomys amblyonx.
Gliricola decuratus (Neumann).[4] (Brazil.)
Hoplomys gymnurus.
Tetragyropus setifer Ewing. (Ecuador.)
Proëchimys mincae.
Tetragyropus lineatus (Neumann). (Colombia.)
Proëchimys securus.
Allogyropus setosus (Neumann).

SCIURIDAE.

Arctomys marmotta.
Allogyropus turbinatus (Piaget). (Europe.)

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[2] This species is included in the subfamily *Gyropinae,* but its generic affinities may not be with the genus *Gyropus* Nitzsch.

[3] Straggler (?).

[4] This species may belong to the genus *Paragliricola* Ewing. Only further study will tell.

PRIMATES.

CEBIDAE.

Aotes boliviensis.

Tetragyropus aotophilus Ewing. (Bolivia.)

UNGULATA: ARTIODACTYLA.

TAGASSUIDAE.

Dicotyles torquatus (a peccary).

Macrogyropus dicotylis (Macalister). (Locality?.)

Pecari angulatus crusnigrum (Chiriqui collared peccary).

Macrogyropus dentatus Ewing. (Nicaragua, Costa Rica.)

CATALOGUE OF THE GYROPIDAE.

Subfamily PROTOGYROPINAE.

Genus PROTOGYROPUS Ewing.

P. normalis Ewing. Proc. U. S. Nat. Mus., vol. 63, 1924, p. 8, pl. 1, fig. 1, and text figs. 2 and 3.

Subfamily GYROPINAE Ewing.

Genus MONOGYROPUS Ewing.

M. longus (Neumann). Bull. Soc. Zool. France, vol. 37, 1912, p. 222, figs. 9 and 10.

M. parvus Ewing. Proc. U. S. Nat. Mus., vol. 63, 1924, p. 11, text fig. 5.

Genus GYROPUS Nitzsch.

G. alpinus Kellogg and Nakayama. Ent. News, vol. 25, 1914, p. 196, pl. 8.

G. forficulatus Neumann. Bull. Soc. Zool. France, vol. 37, 1912, p. 220, figs. 6–8.

G. gracilipes Ewing. Proc. U. S. Nat. Mus., vol. 63, 1924, p. 18, text fig. 7.

G. latipollicaris Ewing. Proc. U. S. Nat. Mus., vol. 63, 1924, p. 17, pl. 1, fig. 4.

G. ovalis Nitzsch. Burmeister's Handbuch, vol. 2, 1838, p. 443.

G. pollicaris Ewing. Proc. U. S. Nat. Mus., vol. 63, 1924, p. 16, pl. 1, fig. 3.

G. wetmorei Ewing. Proc. U. S. Nat. Mus., vol. 63, 1924, p. 19, text figs. 8 and 9.

Genus ALLOGYROPUS Ewing.

A. amplexans (Neumann). Bull. Soc. Zool. France, vol. 37, 1912, p. 224, figs. 11–13.

A. setosus (Neumann). Arch. Paras., vol. 15, 1912, p. 372, fig. 18.

A. turbinatus (Piaget). Pediculines, 1880, p. 612, pl. 50, fig. 7.

Genus TETRAGYROPUS Ewing.

T. aotophilus Ewing. Proc. U. S. Nat. Mus., vol. 63, 1924, p. 23, text fig. 11.

T. lineatus (Neumann). Bull. Soc. Zool. France, vol. 37, 1912, p. 218, figs. 4 and 5.

T. setifer Ewing. Proc. U. S. Nat. Mus., vol. 63, 1924, p. 22, text fig. 10.

Genus MACROGYROPUS Ewing.

M. dentatus Ewing. Proc. U. S. Nat. Mus., vol. 63, 1924, p. 26, pl. 1, fig. 5.

M. dicotylis (Macalister). Proc. Zool. Soc. London, 1869, p. 420.

Genus HETEROGYROPUS Ewing.

H. heteronychus Ewing. Proc. U. S. Nat. Mus., vol. 63, 1924, p. 27, text figs. 2 and 12, pl. 1, fig. 6.

Subfamily GLIRICOLINAE Ewing.

Genus PARAGLIRICOLA Ewing.

P. quadrisetosa Ewing. Proc. U. S. Nat. Mus., vol. 63, 1924, p. 30, text figs. 13 and 14; pl. 1, fig. 7.

Genus GLIRICOLA Mjöberg.

G. distincta Ewing. Proc. U. S. Nat. Mus., vol. 63, 1924, p. 32, text fig. 16.
G. porcelli (Linnaeus). Syst. Nat., 1758, p. 611.
G. porcelli perfoliata (Neumann). Bull. Soc. Zool. France, vol. 37, 1912, p. 216.

UNPLACED SPECIES.

Subfamily GYROPINAE Ewing.

Gyropus hispidus Nitzsch. Burmeister's Handbuch, vol. 2, 1838, p. 443.
Gyropus lagotis Gervais. Gay's Hist. Chile, 1849, p. 103

Subfamily GLIRICOLINAE Ewing.

Gyropus decuratus Neumann. Bull. Soc. Zool. France, vol. 37, 1912, p. 216, fig. 3
Gyropus longicollis Nitzsch. Burmeister's Handbuch, vol. 2, 1838, p. 443.

EXPLANATION OF PLATES.

PLATE 1.

Ventral views of the left tarsus of the anterior legs of some of the different species of Gyropidae. All magnified 500 diameters.

FIG. 1. *Protogyropus normalis*, female.
2. *Gyropus forficulatus*, male.
3. *Gyropus pollicaris*, male.
4. *Gyropus latipollicaris*, male.
5. *Macrogyropus dentatus*, female.
6. *Heterogyropus heteronychus*, female.
7. *Paragliricola quadrisetosa*, female.
8. *Gliricola porcelli*, female.

VENTRAL VIEWS OF THE LEFT TARSUS OF THE ANTERIOR PAIR OF LEGS OF SOME OF THE DIFFERENT SPECIES OF GYROPIDAE.

FOR EXPLANATION OF PLATE SEE PAGE 42.